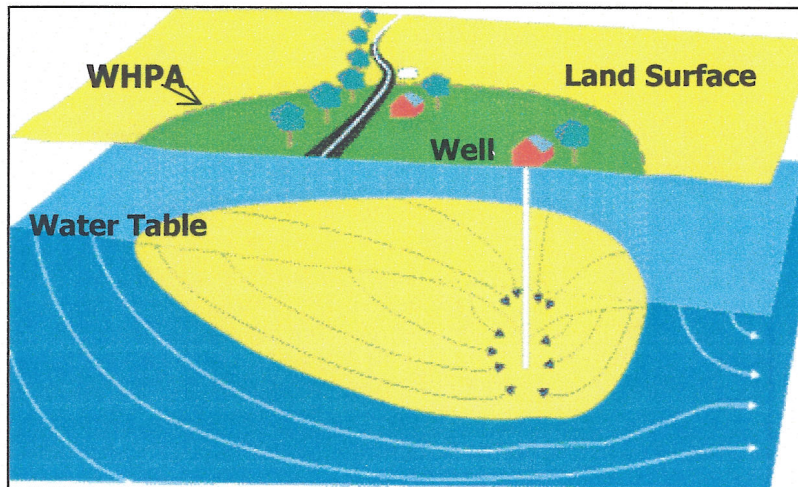


**SOURCE WATER ASSESSMENT**  
**FOR SMALL (UNCONFINED) COMMUNITY WATER**  
**SYSTEMS IN WORCESTER COUNTY, MD**



**Prepared By**  
**Water Management Administration**  
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**May, 2004**



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## SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The five community water systems included in this report are currently using six wells. The Source Water Assessment areas were delineated by the WSP using U.S. EPA approved methods specifically designed for sources in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Maps and aerial photographs showing Source Water Assessment areas are included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the water systems are not susceptible to volatile organic, synthetic organic and microbiological contaminants. Four systems are susceptible to naturally occurring iron, one system is susceptible to nitrates and another may be susceptible to radon based on the final maximum contaminant level that will be adopted for it.



## **INTRODUCTION**

The Water Supply Program has conducted a Source Water Assessment for five small community water systems in Worcester County. Maryland's Source Water Assessment Plan (1999) defines a "small system" as a community or nontransient noncommunity system that has a water appropriation permit of less than 10,000 gallons per day (gpd). Worcester County is located in the eastern shore of Maryland and is bounded by the Atlantic Ocean to the east, Delaware to the north, Virginia in the south and Wicomico and Somerset Counties to the west. Its total population, reported in July 2001 is 45,600 (Md. Assoc. of Counties, 2001/2002). In the summer months due to vacationers in Ocean City the population more than doubles. The five small community systems serve a population of approximately 277 of the county residents. All the five systems are individually owned and operated (table1). The community systems included in this report are shown in figure 1.

## **WELL INFORMATION**

Well information for each system was obtained from the Water Supply Program's database, site visits, well completion reports, and sanitary survey inspection reports and published reports. A total of six wells are currently in use or are backup wells for the five community water systems included in this report. Five of these wells were drilled after 1973 and should comply with Maryland's well construction regulations. No information is available on the two remaining wells. Table 2 contains a summary of well information for each of the systems.

Based on site visits, most wells were in good condition and appeared to be regularly maintained, sealed and protected to insure integrity. Some of the wells had a one-piece well cap, which may present a possible route of contamination (insects) through unscreened vents and electrical holes. This situation can be easily remedied with the installation of a new two-piece sanitary well cap to prevent contamination. Areas around wellheads should be graded in a manner that prevents surface water/ runoff from ponding up at these sites.

## **HYDROGEOLOGY**

Ground water flows through pores between gravel, sand and silt grains in unconsolidated sedimentary rock aquifers such as those used by the community water systems in Worcester County. An aquifer is any formation that is capable of yielding a significant amount of water. The transmissivity is a measure of the amount of water an aquifer is capable of producing and is related to the hydraulic conductivity and the thickness of the aquifer. An unconfined aquifer is one which has no confining beds between the zone of saturation and the surface. A water table is present in an unconfined aquifer and often this type of aquifer is also referred to as a water table aquifer. Recharge for an unconfined aquifer comes from infiltration of precipitation, so that the level of the water table may vary seasonably.

Worcester County lies within the Atlantic Coastal Plain physiographic province. This province, which in Maryland includes roughly the area east of Interstate 95, is underlain by unconsolidated clastic sediments of Lower Cretaceous to recent age, which thicken to the southeast so that they appear wedge-shaped. The thickness of these sediments is greater than 8,500 feet beneath the Atlantic shore. The five small community water systems pump water from the Quaternary sediments, an unconfined aquifer. This aquifer has been studied considerably and hydrologic, lithologic and geochemical data is available in several Maryland Geological Survey reports (1955, 1972, 1974, 1982, and 1993). The descriptive material below is summarized from these reports and the reader is referred to them for further information.

### ***Quaternary Aquifer***

The Quaternary aquifer is used by all the five community systems included in this report. This aquifer is also referred to as the Columbia aquifer or Pleistocene aquifer in MGS reports. The Quaternary sediments are mostly surficial and the aquifer functions as a water-table aquifer. The Quaternary sediments are of fluvial and estuarine origin and are composed predominantly of sand and gravel with some layers of silty clay and clay. Their thickness ranges from a few feet to 220 feet, with the thickest layers located in the northeast and southeast parts of Worcester county. In general, the regional movement of ground water is from areas of with a high water table, corresponding to topographic highs, towards streams, the Chesapeake Bay and the Atlantic Ocean. In areas with high water tables, there may be hydraulic connections with underlying aquifers, and water may move downward to recharge these underlying aquifers. Aquifer tests conducted on Quaternary sediments indicate that transmissivity ranges from 100 to 50,000 ft<sup>2</sup>/ day.

## **SOURCE WATER ASSESSMENT AREA DELINEATION**

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. The WHPAs were delineated using the methodology described in Maryland's Source Water Assessment Plan (MDE, 1999) for small systems using unconfined aquifers in the Coastal Plain. The WHPA for these systems is a wedge shaped area and is based on an annual recharge of 1 foot and the predominant ground water flow direction. The wedge is oriented in the direction of ground water flow with upgradient and downgradient boundaries 1000 feet and 100 feet respectively, from the well. The wedge had an angle of 60 degrees to account for the uncertainty in determining the exact ground water flow direction. The total area of the WHPAs for the five systems is 84.1 acres. The WHPAs for the systems are shown in Figures 4- 7.

## **POTENTIAL SOURCES OF CONTAMINATION**

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, discharge permits, large-scale feeding operations, and CERCLA sites. These sites are generally associated with commercial or industrial facilities that use



chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Non-point sources of contamination are associated with certain land use practices such as the use of pesticides, application of fertilizers or animal wastes, or septic systems that may lead to ground water contamination over a larger area.

No regulated potential point sources of contamination were identified within the WHPAs for the five community water systems. Only one regulated potential contaminant source, a ground water discharge permit, is present about 500 feet outside the WHPA for Tom All Apartments (figure 4). The Sunset Lakes Mobile Home Park WHPA has several above ground heating oil tanks throughout the WHPA. The Mallard Lake Trailer Park WHPA has a dumpster in the vicinity of the well site.

The Maryland Office of Planning's 2000 Land Use Map for Worcester County was used to determine the predominant land use in each WHPA (figure 2). A summary of the total land use within the WHPAs of the five systems is shown in Table 3. Cropland is the largest land use (33%), followed by residential (26%) and forest (25%) within the WHPAs. These land uses are based on the 2000 Worcester County Land Use Map and some of the current land uses may have changed. Pesticides and herbicides used in agriculture are potential non-point sources of Synthetic Organic Compounds (SOCs). The application of fertilizers on agricultural fields is a potential non-point source of nitrate. The use of private septic systems and lawns maintenance and landscaping activities in commercial and residential areas are potential non-point sources of nitrate and SOC to ground water.

A review of the Maryland Office of Planning 2001 Worcester County Sewer Map indicates that there are no plans for sewer service for 37% of the WHPAs (figure 3 and table 4). All the systems in this report currently rely on onsite disposal of domestic wastewater except for Greenridge Trailer Park which is connected to public sewer. Onsite septic systems are potential sources of nitrate and pathogens in ground water.

Other sources that may potentially contaminate ground water supplies include unregulated heating oil underground storage tanks, stormwater drainage ditches, stormwater management ponds, and roads and parking lots within or near WHPAs. Roads are a concern in the event of chemical or petroleum spills, and from the over-application of salts and other chemicals used for snow removal.

## **WATER QUALITY DATA**

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) contaminants. All data reported is from the finished (treated) water unless otherwise noted. The State's SWAP defines a threshold for reporting water quality data as 50% of the Maximum Contaminant Level (MCL) in at least 10% of the samples. If a monitoring result is greater than 50% of the MCL, this report will describe the sources of such a contaminant and, if possible, locate the specific sources that are the cause of the elevated contaminant level. Table 5 summarizes the various treatment methods used at the water treatment plants for each of the five

community water systems. Five of the systems have high iron in their raw water and are treating for removal of iron prior to distribution of the water supply.

A review of the monitoring data for the five systems indicates that currently the water supplies meet the drinking water standards for five of them. Table 6 summarizes the water quality results for each of the water systems by contaminant group.

#### ***Inorganic Compounds (IOCs)***

A review of the data shows that nitrate has been detected above the MCL in the Mallard Lake Trailer Park's water supply since June 2002 (table 7a). The system has been notified by the Water Supply Program to find another source of water supply or to install treatment. The system indicated that they notified the residents about the nitrate levels and informed MDE that they were planning to shut down the trailer park by the end of September 2003. The trailer park is still open and the county and State have cited the owner for operating without a license and for drinking water violations. No IOCs have been detected above 50% of the MCL in any of the other five systems. Only nitrate data is available for Greenridge Trailer Park.

Iron has a secondary MCL of 0.3 ppm based on taste, color and odor problems in drinking water as well as iron bacteria build-up around the well screen. Tom All Apartments had detections of 4.75 ppm (1996) and 0.46 (1999) ppm, and Sunset Lakes Mobile Home Park had detections of 0.53 ppm (1984) and 0.41 ppm (1986) in the raw water. No raw water data for iron was available for Delmarva Mobile Home Park or Greenridge Trailer Park.

#### ***Radionuclides***

No radionuclides above 50% of the MCL have been detected in the systems assessed in this report.

Radon-222 was reported above 150 pCi/L in one community water system (table 7). There is currently no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternate of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air. The health effects of radon found at levels in ground water are negligible compared to breathing radon. Since an MCL has not been finalized, this report considers the lowest proposed MCL of 300 pCi/L, in an effort to be more conservative and protective of public health. Radon is present in ground water due to radioactive decay of uranium bearing minerals in the sediment that makes up the aquifer material.

#### ***Volatile Organic Compounds (VOCs)***

No VOCs above 50% of the MCL have been detected in any of the five systems assessed in this report. Trihalomethanes (THMs) like chloroform, bromodichloromethane and chloromethane have been detected at levels well below 50% of the MCL in two of the systems (0230203 and 0230217). THMs are



disinfection products that are a result of the reaction between chlorine and organic material in the water system.

### ***Synthetic Organic Compounds (SOCs)***

No SOC's have been detected above 50% of the MCL in five of the systems assessed in this report. No SOC sampling data was available for Greenridge Trailer Park. Di(ethylhexyl)phthalate, dalapon, and pentachlorophenol were detected once at levels well below 50% their respective MCLs. Each of these SOC's was only detected one time in a different system. Phthalate was also detected in the laboratory blanks and hence does not represent the water quality in this supply.

### ***Microbiological Contaminants***

Routine bacteriological monitoring is conducted in the finished water for each water system on a monthly basis and measures total coliform bacteria. Since three of the water systems disinfect their water at the treatment plant, the finished water data does not give much indication of the quality of raw water directly from the well (table 8). Raw water samples were collected for these three systems and analyzed for bacteria (total and fecal coliform). No bacteria were detected in any of these samples.

Total coliform bacteria are not pathogenic, but are used as an indicator organism for other disease-causing microorganisms. A major breach of the system or the aquifer would likely cause a positive total coliform result despite disinfection and would require followup total and fecal coliform analysis. One water system (Sunset Lakes Mobile Park) had positive total coliform in one bacteriological sample. Followup sampling showed an absence of total coliform. No bacteria has been detected any of the samples for Mallard Lake Trailer Park.

## **SUSCEPTIBILITY ANALYSIS**

The wells serving the five community water systems included in Worcester County pump water from an unconfined aquifer. In general, water supplies in unconfined aquifers are susceptible to contamination from land use activities in the wellhead protection area. Well completion reports indicate the presence of thin layers and lenses of clay between the surface and the well screen. The clayey sediments may inhibit the infiltration of some of the surface contaminants into the aquifer. Continued routine monitoring of contaminants is essential in assuring a safer drinking water supply. Some contaminants like radionuclides and other chemical elements like iron are naturally occurring in the aquifer and in some instances can reach concentrations that may pose a risk to the water supply.

The susceptibility of the source water to contamination is determined for each group of contaminants based on the following criteria: 1) the presence of natural and anthropogenic contaminant sources within the WHPA, 2) water quality data, 3) well integrity, and 4) the aquifer conditions. The susceptibility analysis is summarized for each water system in table 9.

### ***Inorganic Compounds***

Nitrate has been detected above the MCL in Mallard Lake Trailer Park's water supply since June 2002. Elevated nitrates are contributed by onsite sewer disposal and agricultural land. The land disposal of poultry litter can often exceed the crops ability to use nitrogen, thereby contributing to elevated nitrogen levels. The owner of the system notified MDE that the trailer park will be closing down end of September 2003, but have continued operating this facility. The county and State are currently pursuing legal action to close down the trailer park.

Tom All Apartments, Greenridge Trailer Park, and Delmarva and Sunset Lake Mobile Home Parks have treatment for iron removal due to high levels of iron in the raw water. Iron is a naturally occurring element that is present in aquifer material.

Based on the above discussion Tom All Apartments, Greenridge Trailer Park and Delmarva and Sunset Lakes Mobile Home Parks are susceptible to iron, but not to other IOCs. Mallard Lake Trailer Park is susceptible to nitrate, but not to other IOCs.

### ***Radionuclides***

Only Sunset Lakes Mobile Home Park had significant levels of radon-222. The source of radon in ground water can be traced back to the natural occurrence of uranium in rocks.

There is currently no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternate of 400 pCi/L if the State has program to address the more significant risk from radon in indoor air. Using the more conservative lower proposed MCL, Sunset Lakes Mobile Home Park had radon levels greater than 50% of 300 pCi/L in two samples.

Based on the natural occurrence of radon in the aquifer and water quality data, Sunset Lakes Mobile Home Park **may be susceptible** to radon-222 if the lower proposed MCL of 300 pCi/L for radon-222 is considered. The other four community systems are **not susceptible** to radiological contaminants.

### ***Volatile Organic Compounds***

No VOCs have been detected above 50% of the MCL in any of the systems assessed in this report. No potential sources of VOCs were identified within the WHPAs of the five systems. The only VOCs detected were low levels of THMs which are disinfection by-products from the reaction between the chlorine and organic material in the water supply system.

Based on the above discussion, the five community systems are **not susceptible** to contamination by VOCs.



### ***Synthetic Organic Compounds***

No SOCs above 50% of the MCL have been detected in the five systems assessed in this report. No SOCs sampling data was available for Greenridge Trailer Park. Pentachlorophenol was detected at a very low concentration in Tom All Apartment's water supply. Dalapon was detected at very low levels in Delmarva Mobile Home Park's water supply. None of these SOCs were detected again in subsequent sampling. The sources of SOCs to ground water include point and non-point sources such as pesticide application. No potential point sources were identified within or near the WHPAs for any of the systems. Non-point sources include pesticides applied to agricultural fields, commercial properties and residential lawns. Cropland makes up a significant portion of the land use within the respective WHPAs. If guidelines for pesticide application are followed correctly, the threat to water quality is significantly reduced.

Based on the above discussion, four water supply systems are **not susceptible** to SOCs. The susceptibility of Greenridge Trailer Park cannot be assessed since no SOC sampling data is available.

### ***Microbiological Contaminants***

Based on coliform sampling data and the aquifer characteristics, the five community water systems assessed in this report are **not susceptible** to microbiological contaminants present on the surface including *Giardia* and *Cryptosporidium*.

## **MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA**

With the information contained in this report, the individual community water systems in Worcester County are in a position to protect their water supplies by staying aware of the areas delineated for source water protection. Specific management recommendations for consideration are listed below:

### ***Planning /New Development***

- MDE recommends that water supply owners within Worcester County should encourage the County to develop a countywide wellhead protection ordinance to protect all public water systems.
- Individual systems should be aware of the WHPA and evaluate possible effects to their water supply before making any changes to their property. They should voice their concern to the zoning office when they become aware of any changes to neighboring properties.

### ***Cooperative Efforts with Other Agencies***

- Systems that have cropland making up part of their WHPAs can request the assistance of the University of Maryland Agricultural Extension Service and the Soil Conservation Service to work with farmers to adopt Best Management Practices (BMPs) for cropland located in their WHPA.
- The systems may also encourage farmers to participate in the New Conservation Reserve Program (CREP) applicable to cropland located within WHPAs. Government

funding is available to qualified farmers equal to the cost and financial benefit of farming the area. The National Resources Conservation Service is responsible for determining the environmental benefits of each acre offered for participation.

***Public Awareness and Outreach***

- The Consumer Confidence Report should list that this report is available to the general public through their county library, or by contacting the operator or MDE.

***Monitoring***

- Continue to monitor for all required Safe Drinking Water Act contaminants
- Annual raw water bacteriological testing is a good check on well integrity.

***Contaminant Source Inventory Updates/ Inspections/ Maintenance***

- Conduct a survey of the WHPA and inventory any potential sources of contamination, including unused wells that may not have been included in this report. Keep records of new development within the WHPA and new potential sources of contamination that may be associated with the new use.
- Work with the County Health Department to ensure that there are no unused wells within the WHPA. An improperly abandoned well can be a potential source of contamination to the aquifer.
- Water operation personnel should have a program for periodic inspections and maintenance of the supply wells and backup wells to ensure their integrity and protect the aquifer from contamination.

***Changes in Use***

- Water system owners are required to notify the MDE Water Supply Program if new wells are to be added or if they wish to increase their water usage. An increase in use or the addition of new wells may require revisions to the WHPA.



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- U.S. Environmental Protection Agency, 1991, Wellhead Protection Strategies for Confined-Aquifer Settings: Office of Ground Water and Drinking Water, EPA/570/9-91-008, 168 p.

## **OTHER SOURCES OF DATA**

Water Appropriation and Use Permits  
Public Water Supply Sanitary Survey Inspection Reports  
MDE Water Supply Program Oracle® Database  
MDE Waste Management Sites Database  
Department of Natural Resources Digital Orthophoto Quarter Quadrangles  
USGS Topographic 7.5 Minute Quadrangles for Worcester County  
Maryland Office of Planning 2000 Worcester County Land Use Map  
Maryland Office of Planning 1995 Worcester County Sewer Map

**TABLES**

<b>Public Water System ID (PWSID)</b>	<b>System Name</b>	<b>Owner/Operator Type</b>	<b>Population Served</b>
0230203	DELMARVA MOBILE HOME PARK	Investor/Trust/Water Assoc.	62
0230204	GREENRIDGE TRAILER PARK	Investor/Trust/Water Assoc.	25
0230217	TOM ALL APARTMENTS	Investor/Trust/Water Assoc.	40
0230220	SUNSET LAKES MOBIL HOME PARK	Investor/Trust/Water Assoc.	120
0230225	MALLARD LAKE TRAILER PARK	Investor/Trust/Water Assoc.	30

**Table 1. Small Community Water Systems (Unconfined) in Worcester County**



PWSID	System Name	Plant ID	Source ID	Use Code	Well Name	Well Permit	Well Depth	Casing Depth	Year Drilled	Aquifer
0230203	DELMARVA MOBILE HOME PARK	01	01	P	DELMARVA 1	WO810005	63	58	1981	QUATERNARY SEDIMENTS
			02	S	DELMARVA 2	WO810771	112	92	1984	QUATERNARY SEDIMENTS
0230204	GREENRIDGE TRAILER PARK	01	01	P	GREENRIDGE TP WELL	N/A	N/A	N/A	N/A	QUATERNARY SEDIMENTS
0230217	TOM ALL APARTMENTS	01	01	P	TOM ALL APTS	WO731320	107	97	1978	QUATERNARY SEDIMENTS
0230220	SUNSET LAKES MOBILE HOME PARK	01	02	P	SUNSET LAKES 1 (NEW)	WO730337	76	68	1974	QUATERNARY SEDIMENTS
0230225	MALLARD LAKE TRAILER PARK	01	01	P	MALLARD LAKE WELL	N/A	N/A	N/A	N/A	QUATERNARY SEDIMENTS

**Table 2. Well Information**

Use Code P = Production  
S = Standby

LAND USE CATEGORIES	AREA (in acres)	PERCENTAGE OF TOTAL AREA
Low Density Residential	15.22	18.1
Medium Density Residential	6.39	7.6
Commercial	14.08	16.7
Cropland	27.75	33.0
Forest	20.66	24.6

**Table 3. Summary of Land Use within all the WHPAs**

SEWER SERVICE AREA	AREA (in acres)	PERCENTAGE OF TOTAL AREA
Existing Service Area	47.67	56.7
Service Within 3 to 5 years	5.67	6.7
No Planned Service Area	30.76	36.6

**Table 4. Summary of Sewer Service Areas within all the WHPAs**

PWSID	System Name	Plant ID	Treatment Name	Purpose
0230203	DELMARVA MOBILE HOME PARK	01	HYPOCHLORINATION, POST	Disinfection
			ION EXCHANGE	Iron Removal
0230204	GREENRIDGE TRAILER PARK	01	ION EXCHANGE	Iron Removal, Softening
0230217	TOM ALL APARTMENTS	01	HYPOCHLORINATION, POST	Disinfection
			ION EXCHANGE	Iron Removal
0230220	SUNSET LAKES MOBILE HOME PARK	01	ION EXCHANGE	Iron Removal
0230225	MALLARD LAKE TRAILER PARK	01	NO TREATMENT	None

**Table 5. Treatment Methods**



PWSID	System Name	Plant ID	Nitrates		Other IOCs		Radionuclides		VOCs		SOCs	
			No. of Samples Collected	No. of Samples > 50% MCL	No. of Samples Collected	No. of Samples > 50% MCL	No. of Samples Collected	No. of Samples > 50% MCL	No. of Samples Collected	No. of Samples > 50% MCL	No. of Samples Collected	No. of Samples > 50% MCL
0230203	DELMARVA MOBILE HOME PARK	01	11	0	4	0	4	0	9	0	2	0
0230204	GREENRIDGE TRAILER PARK	01	2	0	0	0	0	0	1	0	0	0
0230217	TOM ALL APARTMENTS	01	13	0	6	0	4	0	5	0	3	0
0230220	SUNSET LAKES MOBILE HOME PARK	01	16	0	6	0	5	2	8	0	2	0
0230225	MALLARD LAKE TRAILER PARK	01	14	14	1	0	1	0	3	0	1	0

**Table 6. Summary of Water Quality Results**

PWSID	System Name	Plant ID	Contaminant	MCL (mg/l)	Sample Date	RESULT (mg/l)
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	6-Jun-02	15.4
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	17-Jun-02	15.7
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	17-Jul-02	12.9
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	22-Aug-02	12.39
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	24-Sep-02	12.09
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	29-Oct-02	10.2
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	19-Nov-02	10.85
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	10-Dec-02	11.6
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	15-Jan-03	11.7
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	12-Feb-03	16.9
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	19-Feb-03	15.2
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	11-Mar-03	11.1
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	15-Apr-03	10.9
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	10-Jun-03	19.2
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	21-Jul-03	15.8
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	15-Aug-03	15.4
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	10-Sep-03	13.8
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	31-Oct-03	12.8
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	25-Nov-03	15.2
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	30-Dec-03	14.7
0230225	MALLARD LAKE TRAILER PARK	01	NITRATE	10	30-Jan-04	15.02

**Table 7a. Results of Inorganic Compounds where detected at least once above 50% of the MCL**

PWSID	System Name	Plant ID	Contaminant	MCL (pCi/L)	Sample Date	RESULT (pCi/L)
0230220	SUNSET LAKES MOBILE HOME PARK	01	RADON-222	300/4000*	6-Jun-94	195
0230220	SUNSET LAKES MOBILE HOME PARK	01	RADON-222	300/4000*	3-Nov-97	165

**Table 7b. Results of Radionuclides where detected at least once above 50% of the MCL**

\* proposed MCLs

PWSID	PWS_NAME	No. of Samples Collected	No. of Positive Samples	Disinfection Treatment
0230203	DELAMARVA MOBILE HOME PARK	85	0	Y
0230204	GREENRIDGE MOBILE HOME PARK	10	0	N
0230217	TOM ALL APARTMENTS	83	0	Y
0230220	SUNSET MOBILE HOME PARK	81	1	N
0230225	MALLARD LAKE TRAILER PARK	20	0	N

**Table 8. Routine Bacteriological Monitoring Results from System Distribution**

(Sample results are since 1995)



PWSID	SYSTEM NAME	Is the Water System Susceptible to....					
		Nitrate	Other Inorganic Compounds	Radionuclides	Volatile Organic Compounds	Synthetic Organic Compounds	Microbiological Contaminants
0230203	DELMARVA MOBILE HOME PARK	NO	NO*	NO	NO	NO	NO
0230204	GREENRIDGE TRAILER PARK	NO	NO*	NO DATA	NO DATA	NO DATA	NO
0230217	TOM ALL APARTMENTS	NO	NO*	NO	NO	NO	NO
0230220	SUNSET LAKES MOBILE HOME PARK	NO	NO*	YES	NO	NO	NO
0230225	MALLARD LAKE TRAILER PARK	YES	NO	NO	NO	NO	NO

**Table 9. Susceptibility Analysis Summary**

\*except for iron

**FIGURES**

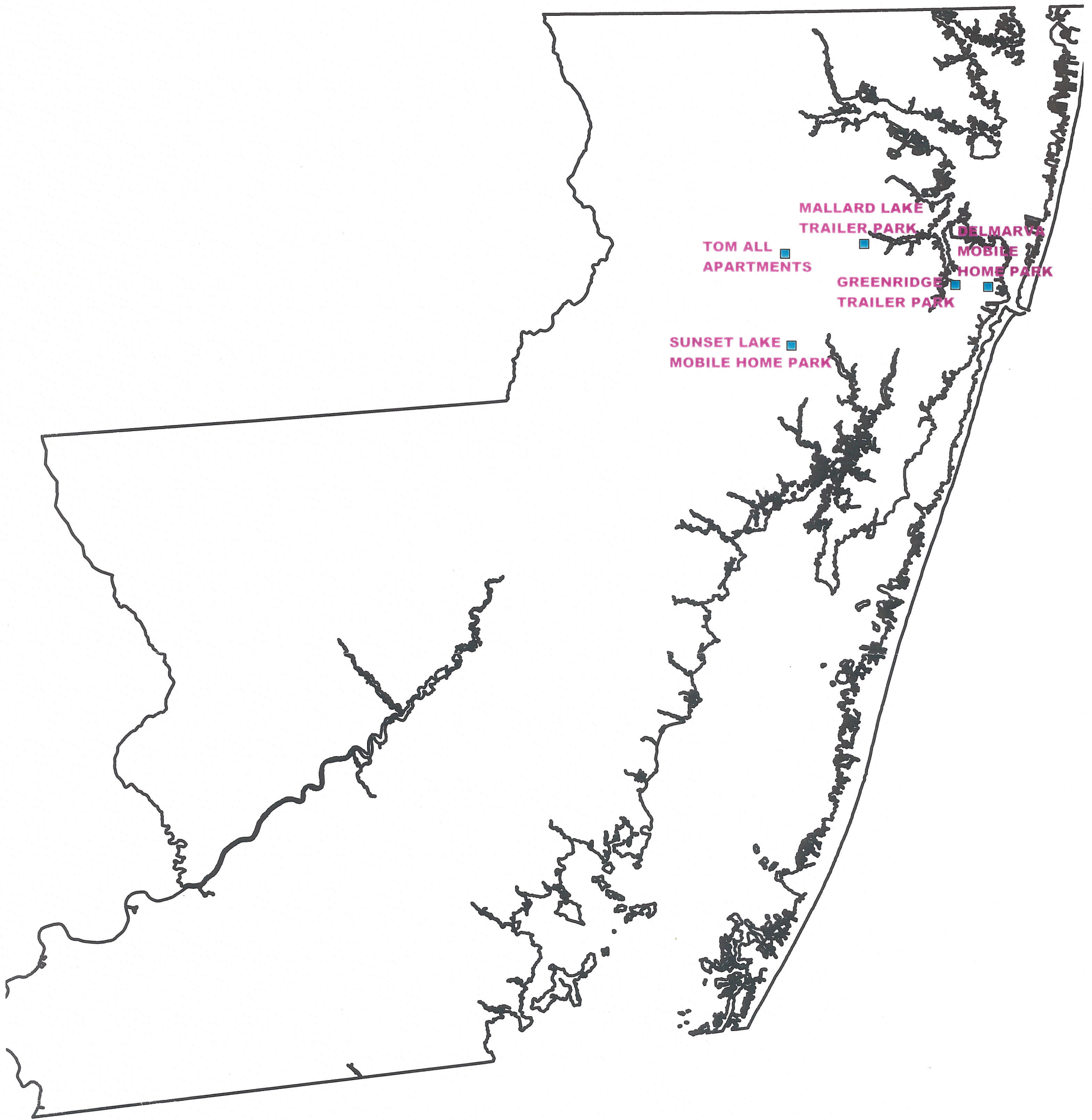


Figure 1. Location of Small Community Water Systems in Worcester County

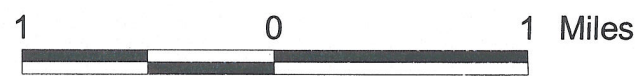
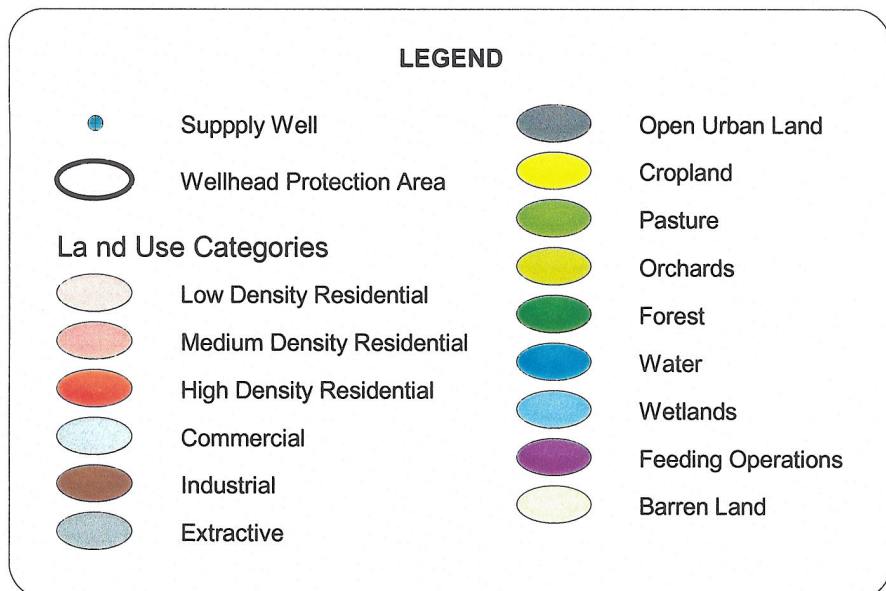
2 0 2 4 Miles







Figure 2. Land Use Map for the northeast part of Worcester County



Base Map: 2000 Land Use Map for Worcester County



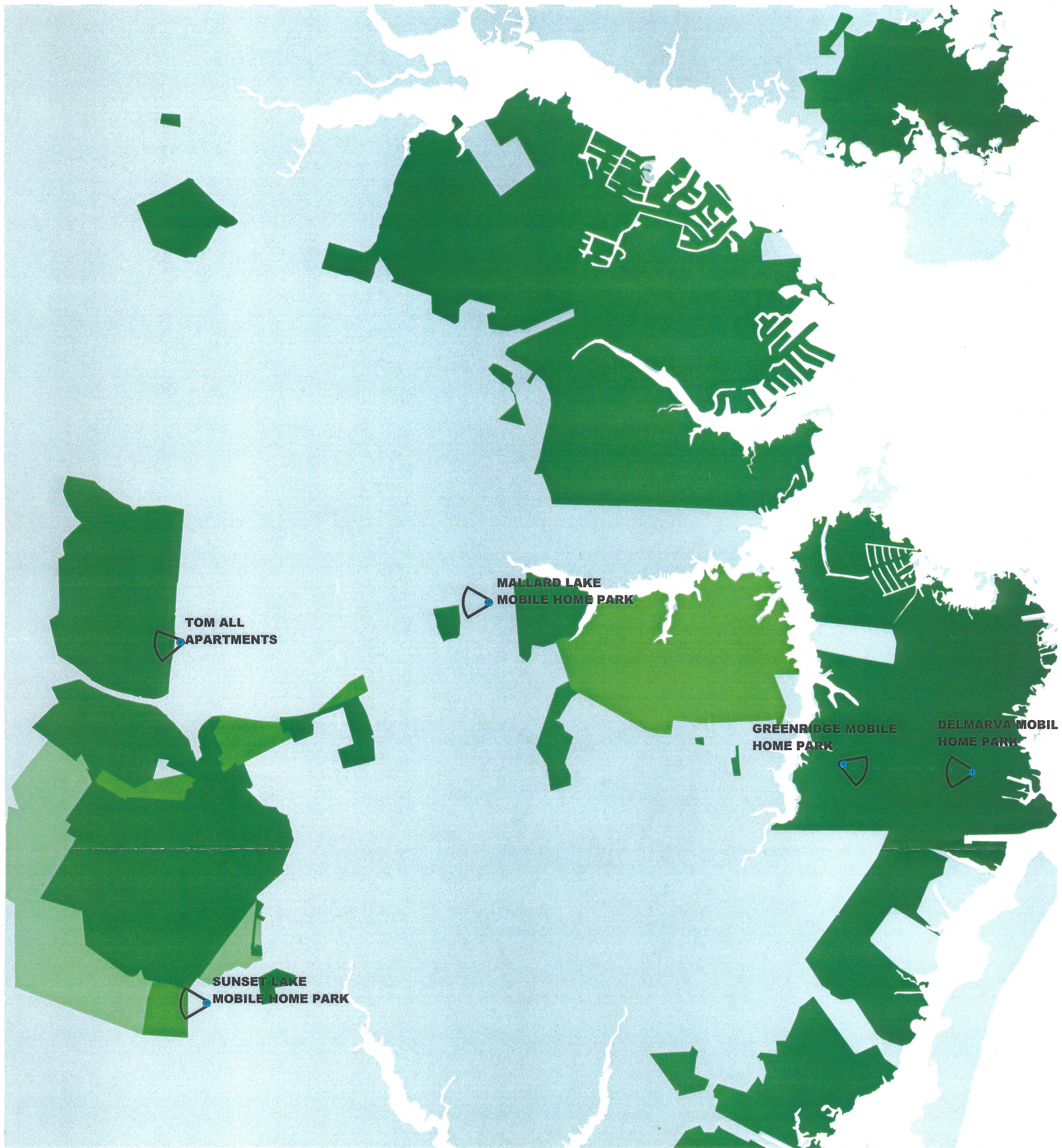


Figure 3. Sewer Service Map for the northeastern part of Worcester County





**APPENDIX**



## **EXECUTIVE SUMMARY**

### **DELMARVA MOBILE HOME PARK**

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County, including the Delmarva Mobile Home Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The Delmarva Mobile Home Park water system is currently using one well for its water supply, and the other one as a standby well. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for supplies in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and sewer service areas within the Source Water Assessment areas for all the water systems is included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Delmarva Mobile Home Park water supply is susceptible to naturally occurring iron but not to any of the regulated contaminants.

## **EXECUTIVE SUMMARY GREENRIDGE TRAILER PARK**

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County, including the Greenridge Trailer Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The Greenridge Trailer Park water system is currently using one well for its water supply. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for supplies in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and sewer service areas within the Source Water Assessment areas for all the water systems is included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Greenridge Trailer Park water supply is susceptible to naturally occurring iron but not to any of the regulated contaminants.

## **EXECUTIVE SUMMARY TOM ALL APARTMENTS**

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County, including the Tom All Apartments water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The Tom All Apartments water system is currently using one well for its water supply. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for supplies in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and sewer service areas within the Source Water Assessment areas for all the water systems is included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Tom All Apartments water supply is susceptible to naturally occurring iron but not to any of the regulated contaminants.



## **EXECUTIVE SUMMARY**

### **SUNSET LAKES MOBILE HOME PARK**

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County, including the Sunset Lakes Mobile Home Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The Sunset Lakes Mobile Home Park water system is currently using one well for its water supply. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for supplies in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and sewer service areas within the Source Water Assessment areas for all the water systems is included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Sunset Lakes Mobile Home Park water supply is susceptible to naturally occurring but not to other inorganic compounds, or volatile organic compounds, synthetic organic compounds, and microbiological contaminants. The water supply may be susceptible to radon based on the final Maximum Contaminant Level that will be adopted for it.

## **EXECUTIVE SUMMARY MALLARD LAKE TRAILER PARK**

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for five small community water systems in Worcester County, including the Mallard Lake Trailer Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The water supply source of these five small community systems in Worcester County is an unconfined aquifer, the Quaternary sediments of the Atlantic Coastal Plain physiographic province. The Mallard Lake Trailer Park water system is currently using one well for its water supply. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for supplies in unconfined aquifers.

Potential point sources of contamination were researched and identified within the assessment areas from field inspections, contaminant and well inventory databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and sewer service areas within the Source Water Assessment areas for all the water systems are included in this report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Mallard Lake Trailer Park water supply is susceptible to nitrate, but not susceptible to other inorganic compounds, or volatile organic compounds, synthetic organic compounds, radionuclides and microbiological contaminants.